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GB 2083301 A WO 92/06552 A1 US 4408185 A

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(54) **Circuit arrangement for the transmission of information over a two-wire line**

(57) The arrangement uses, for the purposes of coding and transmitting information on a two-wire line 4 between a transmitter 1 and a receiver 5, direct voltage or current pulses which contain the information in the period or frequency. This is achieved in that the transmitter 1 switches the operating voltage for the receiver 5 off briefly means of a semiconductor switch 3. Digital to analogue conversion and vice versa are no longer necessary. Furthermore, a high make-to-break ratio is employed so that the supply to the receiver is always ensured, and receiver 5 includes a voltage stabilisation device 6, decoder 8 and indicator 7.

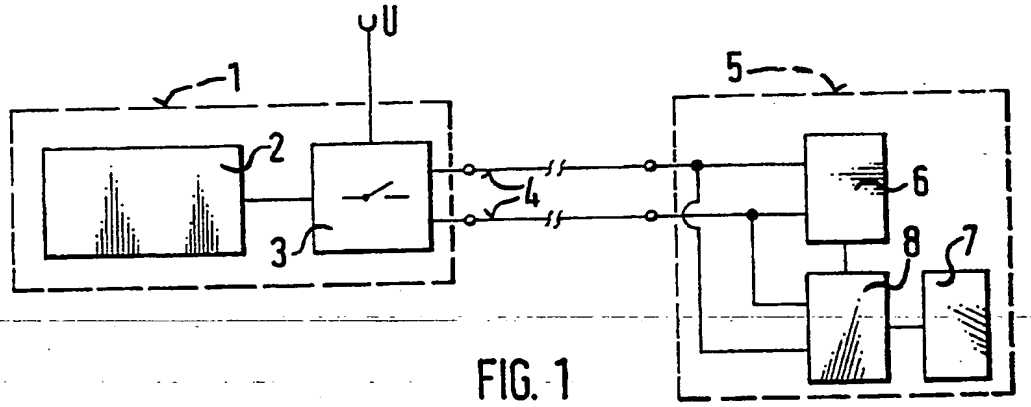

FIG. 1

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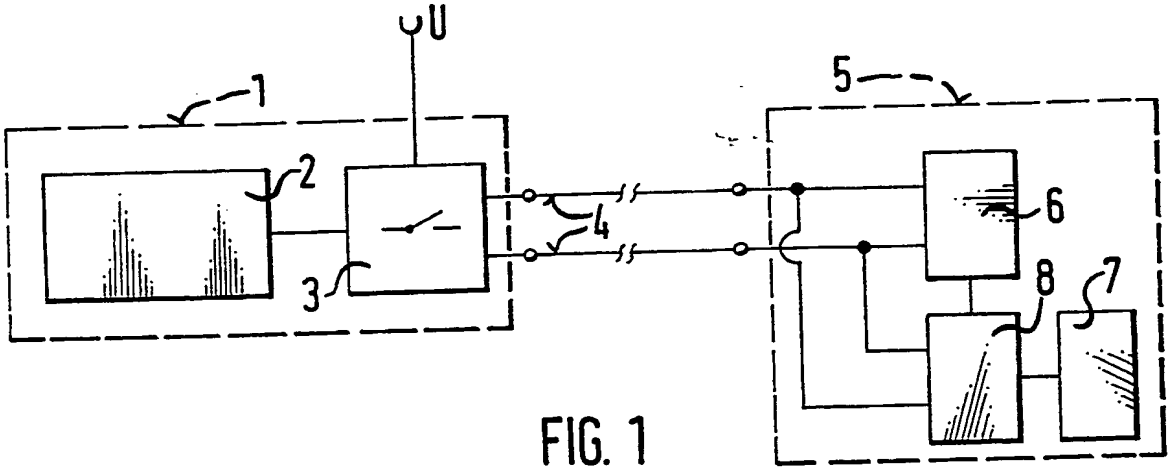

FIG. 1

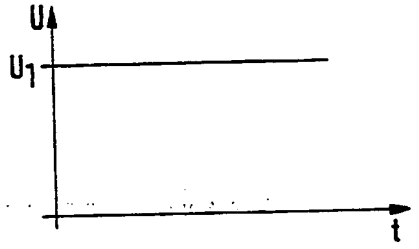

FIG. 2

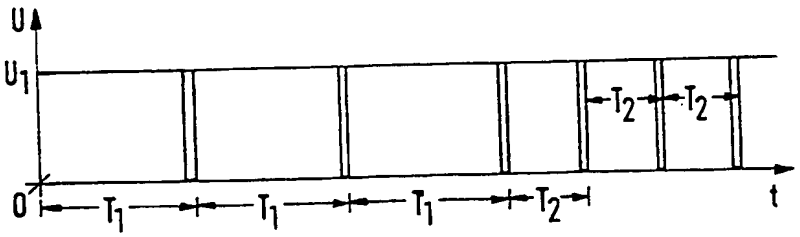

FIG. 3

Circuit arrangement for the transmission of information over a two-wire line

State of the art

The invention is based on a circuit arrangement with a two-wire line between a transmitter and a receiver in accordance with the generic type of the primary claim. A circuit arrangement for the transmission of a supply voltage and a control signal is already known from DE 37 17 260 A1 in which the power stage of a solenoid-operated valve is controlled through a two-conductor cable. At the one end, a microcomputer is used to transform the control signal for the power stage into an alternating voltage by means of pulse-width modulation. At the other end, a rectifier is connected before the power stage to derive the operating voltage for the power stage from the alternating voltage. This solution is not beneficial, since a signal which is initially in digital form is converted into an analogue signal before transmission. After transmission, it is converted back into a digital signal to allow the solenoid-operated valve to be controlled digitally.

Advantages of the invention

The circuit arrangement in accordance with the invention with the characterizing features defined in the primary claim has, by contrast, the advantage that no digital/analogue conversion is necessary, the information rather being derived directly from the period or its frequency. A further advantage is that a very simple circuit arrangement results, since the information can be generated by means of a simple semiconductor switch by

briefly dropping the operating voltage applied to the two-wire line. The significant make-to-break ratio has the further advantage that a significant level of power can be transmitted over the two-wire line without the consumer unit connected to the line being damaged by the operating voltage being briefly dropped. Since, furthermore, only direct voltage or direct current pulses are transmitted, it is largely possible to use normal commercially available integrated circuits, on which it is not necessary to make particularly high cut-off protection requirements. This results in a beneficially inexpensive circuit construction.

Advantageous extensions and improvements of the circuit arrangement specified in the primary claim are possible through the measures listed in the subsidiary claims.

The information can easily be coded and decoded if just one parameter is modified and the other parameters remain unchanged.

Adequate power to control a connected receiver or a consumer unit can also advantageously be made available by the fact that the make-to-break ratio is greater than 50%, and thus voltage dip or data loss is not to be anticipated.

Commercially available microprocessors can make up a simple coding device, in particular in conjunction with a semiconductor switch since these are inexpensively available in many forms. Microprocessors are easily programmable, thereby promoting the possibility of modifications to programming.

Decoding on the receiver side by means of a microprocessor brings the advantage that decoding of information is also rendered very simple by use of the integrated time functions. A display device connected can, for example, just as easily be controlled by the microprocessor.

Drawing

An embodiment example of the invention is illustrated in the drawing and will be described in more detail below. Figure 1 shows a block circuit diagram, figure 2 a first graph and figure 3 a second graph.

Description of the embodiment example

Figure 1 shows a transmitter 1, connected through a two-wire line 4 to a remotely located receiver 5. The construction of the two-wire line is free in respect of the information to be transmitted, with it also being possible for the two-wire line to be shielded or twisted to screen it against external interference. Said transmitter 1 contains a controller 2 which is preferably designed to include a microprocessor. Said controller 2 is connected with a switch 3 which may be, for instance, a bipolar transistor or a FET (Field Effect Transistor). The transistor is driven by the control output of controller 2, causing the operating voltage U to be switched on or off.

The receiver 5 includes a voltage stabilization device 6, the inputs of which are connected to the two-wire line. A decoder 8, which decodes the information to be transmitted from the pulsed voltage or current pulses and places it on the control inputs of the indicator 7, is connected in parallel with the incoming two-wire line 4.

The function of this circuit arrangement will be described below on the basis of figures 2 and 3. Figure 2 shows a voltage graph, the variation in voltage for which can be measured on the two-wire line 4. In the normal operating case when no information is being transmitted, the voltage U_1 = constant will be detected on the two-wire line, independently of time. The graph of figure 3 will result, for example, if on the other hand information is being transmitted by transmitter 1. This

graph also plots voltage U against time t. In this case, however, voltage U_1 is no longer constant, but is interrupted briefly at short intervals. A period T results for each pulse and each break. A different period is transmitted (for example T_1, T_2) depending on the information, in accordance with the embodiment example of figure 3. Coding for the appropriate period or frequency is implemented in accordance with the table, for example, on the transmitting and receiving ends, with a specific function of the display being controlled depending on the period T. The table shows that segment 1 of the display is switched on at T = 5.0 ms. Segments 1 and 2 of the display are switched on at T = 4.9 ms, etc.

Table

T/ms	Function
5.0	Segment 1 on
4.9	Segment 1, 2 on
4.8	Segment 1, 2, 3 on
4.7	Segment 1, 2, 3, 4 on

The period is determined by the microprocessor incorporating a freely running counter, which increments with a fixed clock pulse.

The current counter value will be saved if an external event occurs (high-low transition at the input port, for instance). All counter values reached at the relevant high-low transitions will be saved if a signal is applied to the input port, as is shown in figure 3. The period T or the frequency f (f = 1/T) can now be calculated if the difference between two neighbouring counter values is determined.

The same period should be transmitted at least three times in order to enhance security of transmission. The appropriate action may be initiated (for example, driving a loudspeaker or

a display) if all three difference values are identical. Controller 2 now controls switch 3 with the period T shown by way of example. The operating voltage U will now be switched on and off as it is applied to the two-wire line 4. The receiver 5 now derives its operating voltage through the voltage stabilizer 6, so that the display 7, or any other consumer unit connected receives a constant voltage.

A microprocessor may, for instance, be used as the decoder 8. The period T or the frequency f can be determined, for example, by using its integrated time functions.

In the same way, the microprocessor may also be used to drive a display (an LCD, for instance) or even a further signalling device (loudspeaker, for instance) and thus issue an optical or acoustic signal.

Claims

1. Circuit arrangement with a two-wire line between a transmitter and a receiver, with the transmitter having means for the generation of voltage and current pulses on the two-wire line for the coding and transmission of information, and with the receiver being constructed such as to derive its operating voltage and to decode the information from the voltage or current pulses received, characterized in that the means (2, 3) in the transmitter (1) form voltage or current pulses for the coded information by switching the operating voltage (U) on or off, in that a significant make-to-break ratio (pulse duration/period) may be used to code the information and in that the information may be coded by modification of the period (T) and/or the make-to-break ratio.

2. Circuitarrangement in accordance with claim 1, characterized in that the means (2, 3) hold the make-to-break ratio, or the pulse length or the period constant, independently of the information to be transmitted.

3. Circuitarrangement in accordance with one of the preceding claims, characterized in that the means (2, 3) select a make-to-break ratio of 50% or more.

4. Circuit arrangement in accordance with one of the preceding claims, characterized in that the means (2, 3) incorporate a controller (2), preferably a microprocessor and that the controller (2) switches the operating voltage (U) through a switch (3) for coding the information.

5. Circuit arrangement in accordance with claim 4, characterized in that the switch (3) is a semiconductor switch.

6. Circuit arrangement in accordance with one of the preceding claims, characterized in that the receiver (5) incorporates a means, for example a stabilizer or controller, to derive the operating voltage and a decoder (8) to decode the information.

7. Circuit arrangement in accordance with claim 6, characterized in that the decoder (8) is, for example, a microprocessor, the control input of which is connected with the two-wire line (4) for a time function.

8. A circuit arrangement substantially as herein described with reference to the accompanying drawing.

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Examiner's report to the Comptroller under Section 17
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Relevant Technical Fields

Search Examiner
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(ii) Int Cl (Ed.5) H03M 5/02, 5/04, 5/06, 5/08, 5/10; H04B 3/50, 3/54

Date of completion of Search
18 NOVEMBER 1994

Databases (see below)
(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii) ONLINE DATABASE: WPI

Documents considered relevant following a search in respect of Claims :-
1-8

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
X	GB 2083301	(SEEBOARD) see Claims 25-27 & EP 0047089 A1	1-7
X	WO 92/06552 A1	(MOTOROLA LIGHTING) page 14, lines 32-36	1-7
X	US 4408185	(ELSMARK A/S) column 4, lines 20-27 & WO 80/01024 A1	1-7

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).